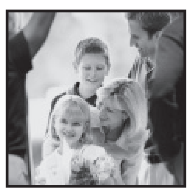
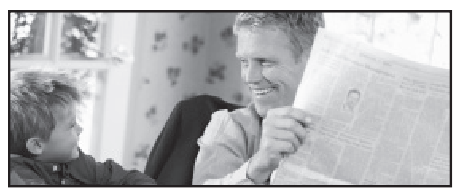
Discussion





Discussion

Although asthma prevalence data in North Carolina are demonstrating downward trends, asthma is still a huge issue in the state. In 2005, 6.5% of adults and 11.5% of children reported currently having asthma. While the percentage of adults with current asthma in North Carolina is below the national median, the percentage of children in North Carolina with asthma exceeds the national median number from the most recent national numbers (2004).

Although asthma affects the whole population, certain subgroups appear to be more adversely affected than others. Gender differences are seen in each of the surveillance measures in this document. Male children in North Carolina have a higher asthma prevalence than female children. Conversely, adult females have a higher prevalence of asthma than adult men in North Carolina. Females also have a higher rate of hospitalization due to a primary cause of asthma than men, as well as a higher rate of mortality due to asthma than North Carolina men.

Age is also factor when looking at who asthma affects. The very young, ages 0 to 4, have the highest rates of hospitalization due to a primary cause of asthma. Adults age 65 and older have the second highest asthma hospitalization rate, following the 0 to 4 age group. Adults in the age group 65+ have a significantly higher mortality due to a primary cause of asthma than all other age groups in North Carolina.

Disparities between racial groups, especially between African Americans, Native Americans and whites in North Carolina, are an issue. According to the 2005 N.C. YRBS, both male and female African American high school students have higher prevalence of asthma than white high school students. Although the 2005 N.C. BRFSS data did not show a statistically significant difference for Native Americans having a higher asthma prevalence of asthma than whites, it has been shown in previous years. This data is consistent with national estimates that show Native Americans are 25% more likely to have been diagnosed with asthma than whites.[12]

Exploring health care utilization data, according to the 2005 N.C. BRFSS, African American adults were more likely than white adults to visit an emergency room or urgent care center three or more times in the previous year because of their asthma. African American children were also more likely than white children to have visited an emergency room or urgent care center in the past year because of asthma. Unfortunately, due to inconsistency in reporting race and ethnicity data, we cannot provide racial and ethnic data on actual hospitalizations.

Although there were only 116 deaths due to asthma in 2005 in North Carolina, African Americans were disproportionately affected. The mortality rate due to a primary cause of asthma in 2005 for African Americans was more than twice that of whites. Looking at the past 6 years (1999-2005), African Americans[a] had a mortality rate due to asthma 2.5 times higher than whites. Minorities[b] have a higher mortality due to a primary cause of asthma in each age group of North Carolinians age 5 and older.

Additionally, low income households were disproportionately affected by asthma. North Carolina adults with a household income less than $15,000 a year were more likely to have higher asthma prevalence than all other income groups. This is similar to national trends, which show that adults in poor families have higher percentages of asthma than adults in families that are not poor.[13]

Currently, very little data is available on provider practices and asthma management, specifically providing each child or adult with asthma with an up to date asthma management plan. According to the 2005 N.C. CHAMP survey, 43% of children

[a]This rate includes Asians and other minorities. These groups make up for such a small number of deaths over the 6 year (23) that they were grouped with African Americans.
[b]The minority group being discussed here is comprised mainly of African Americans (328), but also includes Asians, American Indians, and other non-white racial groups.

with current asthma in North Carolina have reported (parental/guardian report) not receiving an asthma management plan from their physician or other health care professional. North Carolina Asthma Program is working on obtaining similar information from adults, and questions will be included on future statewide telephone surveys, as well in other physician specific project that the Chronic Disease and Injury Section of the North Carolina Division of Public Health, is conducting.

Limitations

While the *Burden of Asthma in North Carolina* is a comprehensive report, there are data gaps and limitations. Data gaps include limited available data on Native Americans, lack of prevalence data on asthma triggers (outside of tobacco smoke), lack of information on health care providers' practices, and a lack of accurate race and ethnicity data in hospitalization records.

Other data gaps concerning hospitalization records include the inability to track repeat visits for persons with asthma to the emergency room or admissions to the hospital. The ability to identify who with current asthma is making multiple emergency room visits and hospitalized repeatedly, would be an extremely beneficial tool for determining asthma management techniques. There is currently no way to track how many repeat visits a patient makes other than self report through the N.C. BRFSS.

Lack of data regarding work related asthma is also an issue in North Carolina. Several methods are currently being investigated as possible methods for filling this gap. The North Carolina Asthma Program will look at how other states are satisfying this data need and try to determine if any of those methods would be appropriate here.

Next Steps

The North Carolina Asthma Program will work together with the statewide coalition, the North Carolina Asthma Alliance, and other partners and stakeholders, to use this data to develop a state asthma plan. The North Carolina State Asthma Plan, that will be available March 2007, will address strategies for reducing the burden of asthma in North Carolina, with a specific emphasis on the disproportionately affected groups described herein. The State Asthma Plan will also provide methods for addressing the limitations discussed above.

The North Carolina Asthma Program will continue to conduct surveillance across the state utilizing a variety of available methods. We will work to fill any data gaps, while continuing to make the most out of the data that we already have. The Asthma Program will also investigate new ways to capture populations that we know are being negatively affected by asthma, but we do not have sufficient data on; including Native Americans and low income households.

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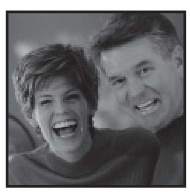
Technical Notes



Technical Notes

Part 1. Odds Ratio

In a study where participants are selected on the basis of their disease status, as in the N.C. BRFSS, the relative risk can be estimated by calculating the ratio of the odds of exposure among the cases to that among the controls. In this document, cases are considered persons who have either lifetime or current asthma, and exposure is gender.[1]

Example – based on the whether a female has a greater odds of having asthma than a male.

	Has Asthma	Does Not Have Asthma
Female	**A**	**B**
Male	**C**	**C**

Odds Ratio (OR) = Odds that an exposed person (female) develops the disease (asthma)
Odds that a non-exposed person (male) develops the disease (asthma)

OR = A*D/B*C

Part 2. Prevalence

Prevalence is defined as the number of affected persons present in the population at a specific time divided by the number of persons in the population at that time. It is used to describe the health burden on a specific population.[2]

Prevalence = <u># of cases of a disease present in the population at a specified time</u>
# of persons in the population at that specified time

Part 3 . Age Adjustment

Populations often differ in age distribution. Therefore, it is often important to control for the differences among the age distributions of populations when making comparisons among death rates to assess the relative risk of death. The direct method of age- adjustment is frequently used to compare the death rates of different populations, by controlling for differences in age distribution. Sum the products of the age-specific death rates and the proportion of the standard population in that age group across all ten age groups. This weighted sum is represented in the following formula:

$$\text{Age-adjusted death rate} = \sum_{i=1}^{10} w_i p_i$$

Where: p_i = the age specific rate for age group i.
w_i = the weight; the proportion of the standard population in age group i.[5]

The standard population used to calculate age-adjusted rates in this document is the 2000 United States Standard Population.

Part 4. Confidence Intervals for Proportions

The confidence interval represents the range within which the true magnitude of effect lies with a certain degree of assurance. A 95% confidence interval states that we are 95% certain that the true measure lies within this specified range.[1]

For example, the estimated current asthma prevalence among North Carolina adults (from a random sample of the population) is 6.5%, with a 95% confidence interval of 6.0% to 7.0%. This means that we are 95% confident that the true prevalence of current asthma for North Carolina adults is no less than 6.0%, and no greater than 7.0%. A 95% confidence uses a multiplier of 1.96.

The formula for the 95% confidence interval is:

$$p \pm 1.96 \sqrt{\frac{p\,q}{n}}$$

Where: p = proportion
n = sample size
q = 1-p (for small values of p (≤ .01) q is small and may be ignored)[4]

Part 5. Confidence Intervals for Death Rates

Confidence intervals are used when looking at the age adjusted death rates in this document. The formula is the age-adjusted proportion of persons who died in this time period (p) plus/minus 1.96 (for a 95% confidence interval) multiplied by the standard error of an age-adjusted death rate, which is:

$$RSE(R'') = 100\,\frac{\sqrt{\Sigma\left\{ w_i^2\, R_i^2 \left(\frac{1}{D_i}\right)\right\}}}{R''}$$

Approximate 95% Confidence Interval: 1-99 deaths

Lower: $R'' * L(1-\alpha = .95, D_{adj})$

Upper: $R'' * U(1-\alpha = .95, D_{adj})$

where

R'' = age-adjusted rate (per 100,000 population) = $\sum w_i R_i$

w_i = i^{th} age-specific Standard Population such that $\sum(w_i) = 1.0$

R_i = age-specific rate (per 100,000) for the i^{th} age group

D_i = total number of deaths for the i^{th} age group upon which age-specific rate is based

$$S(R'') = R'' * \frac{RSE(R'')}{100} = \text{standard error of age-adjusted rate}$$

$L(1-\alpha = .95, D_{adj})$ and $U(1-\alpha = .95, D_{adj})$ are lower and upper 95% confidence limit factors and are shown in table S

$$D_{adj} = \frac{1}{\left(\frac{RSE(R'')}{100}\right)^2} = \text{adjusted number of deaths rounded to nearest integer}$$

Table S found in Technical Appendix from the *Vital Statistics of United States 1999 Mortality*.[6]

Age-Specific confidence intervals for less than 100 deaths.

$$RSE(R) = RSE(D) = 100\sqrt{\frac{1}{D}}$$

Approximate 95% Confidence Interval: 1-99 deaths

Lower: $R * L(1-\alpha = .95, D)$

Upper: $R * U(1-\alpha = .95, D)$

where

R = rate (deaths per 100,000 population)

D = total number of deaths upon which rate is based

$$S(R) = R * \frac{RSE(R)}{100} = \text{standard error of rate}$$

$L(1-\alpha = .95, D)$ and $U(1-\alpha = .95, D)$ are lower and upper 95% confidence limit factors and are shown in table S

Table S found in Technical Appendix from the *Vital Statistics of United States 1999 Mortality*.[6]

Part 6. Trend Analysis

The Spearman Rank Order Correlation test was utilized to determine if there was a trend in total mortality rates from 1995 through 2005, and for age, race, and gender specific mortality rates from 1999 through 2005. This test quantifies the extent to which there is a linear relationship between the rate and year.[1]

The correlation coeffiecient (rho, ρ) can vary between +1.0 and -1.0. If the coefficient equals -1.0, it indicates a perfect negative correlation, with each year having a lower mortality rate for that specific group than the previous year, for example. If the coefficient equals +1.0, it indicates a perfect positive correlation, where each year has a higher mortality rate for that specific group than the previous year. As the correlation coefficient approaches 0.0, from either direction, the relationship between the variables weakens.[3]

The p-value for the Spearman Rank Order Correlation test ranges from 0.0 to 1.0, and gives the probability of finding a significant overall trend when no trend actually exists. The standard used to assess the significance of a statistical test is a p-value of 0.05. A p-value less than or equal to 0.05 indicates that there is at most a 5% chance of observing a tend that, in reality, does not exist. If the p value is greater than 0.05, chance cannot be excluded as a likely explanation for the trend, so the result is not statistically significant.[3]

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